



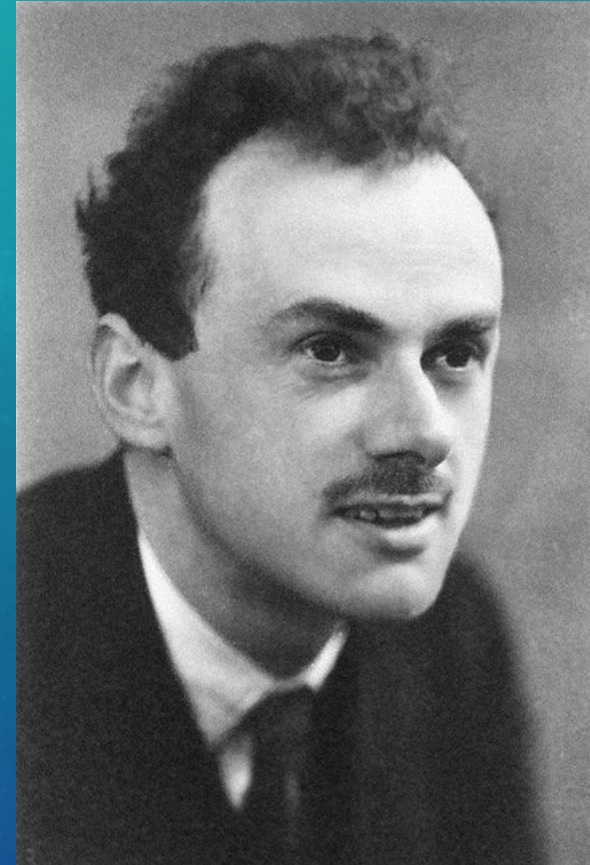
EXPERIENCE FROM BNL

BY: DESTYNNE OLIVER

ANTIMATTER

History

- 1928 Paul Dirac
 - Used Albert Einstein (special relativity) and Erwin Schrodinger(quantum theory) to discover a math equation
- 1965 Antinuclei
 - Testing symmetry, physicists wanted to know how subatomic antiparticles behave when they come together.
 - Would an antiproton and an antineutron stick together to form an antinucleus, just as protons and neutrons stick together to form the nucleus of an atom?
 - Ex: deuteron and antideuteron



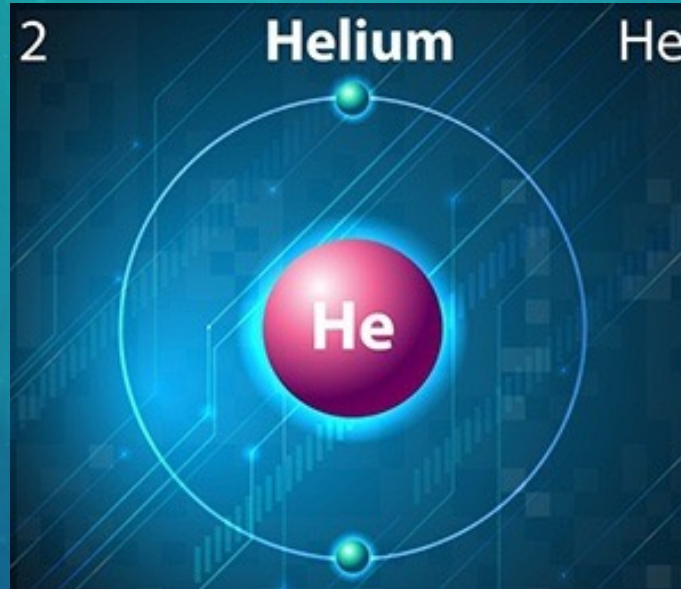
OBSERVATIONS OF ANTIMATTER HELIUM4 NUCLEUS

Helium:

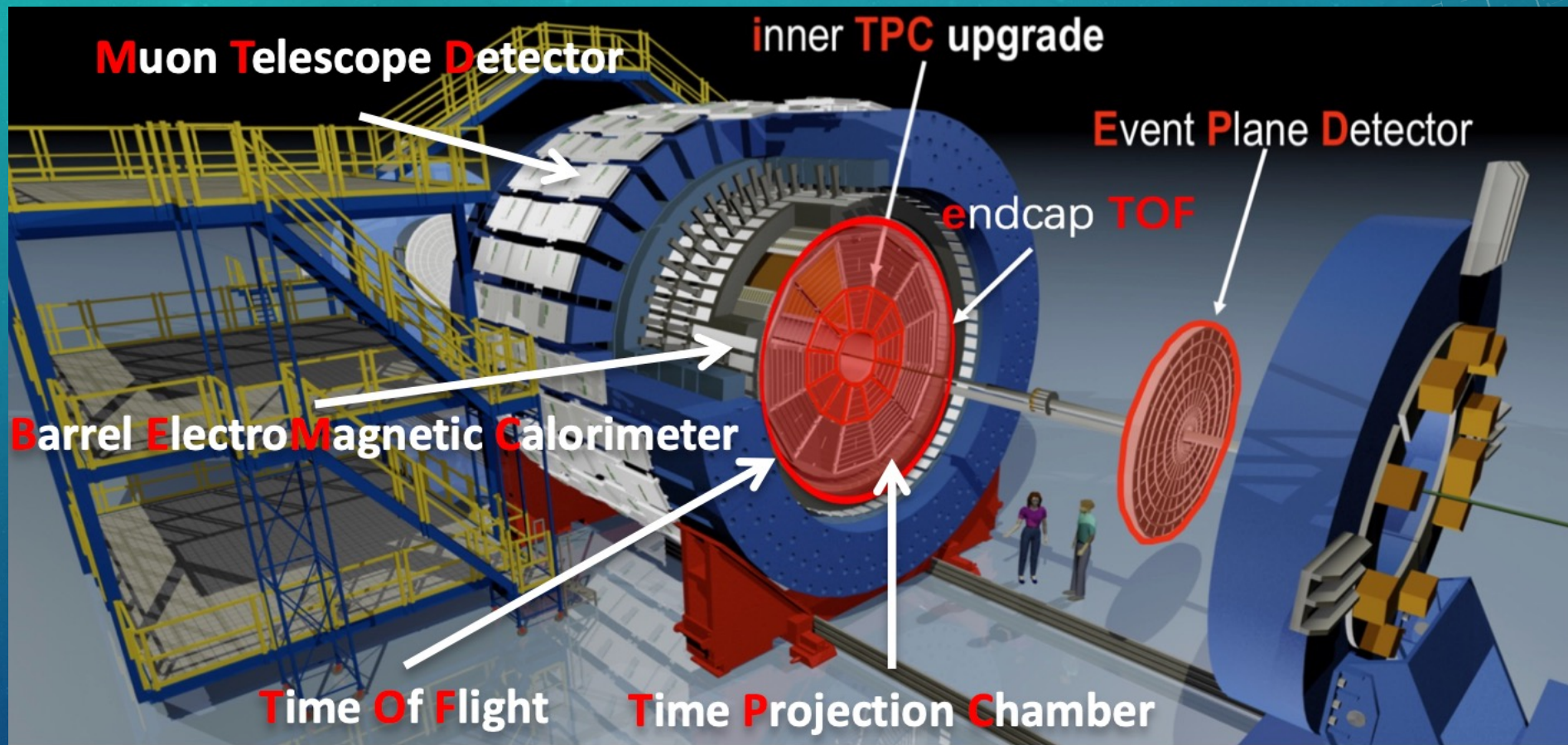
- Stable element
- Used for detecting gas leaks
- Not a noble gas
- Inexpensive

Antihelium 4 (anti-alpha)

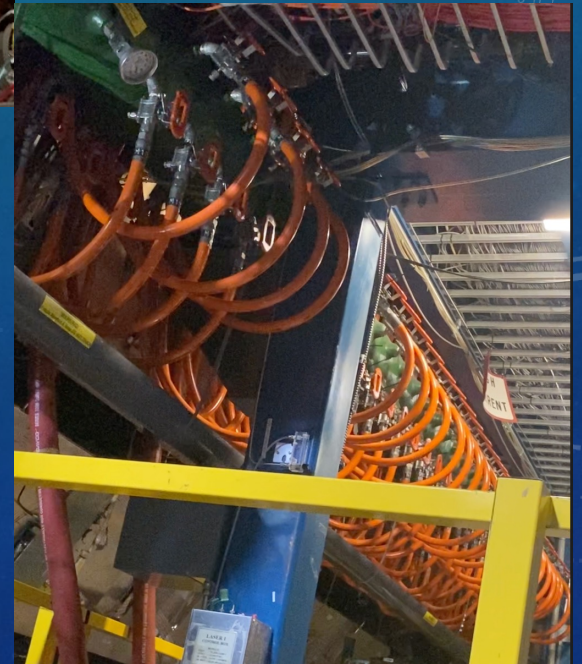
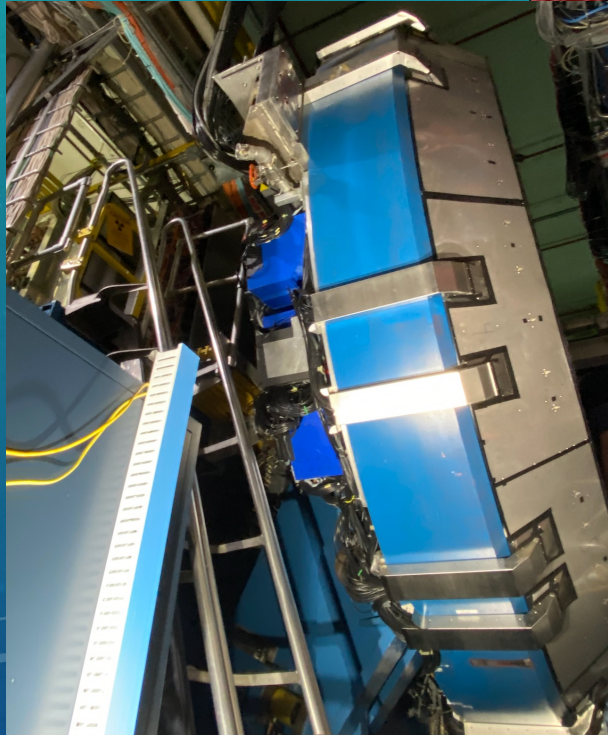
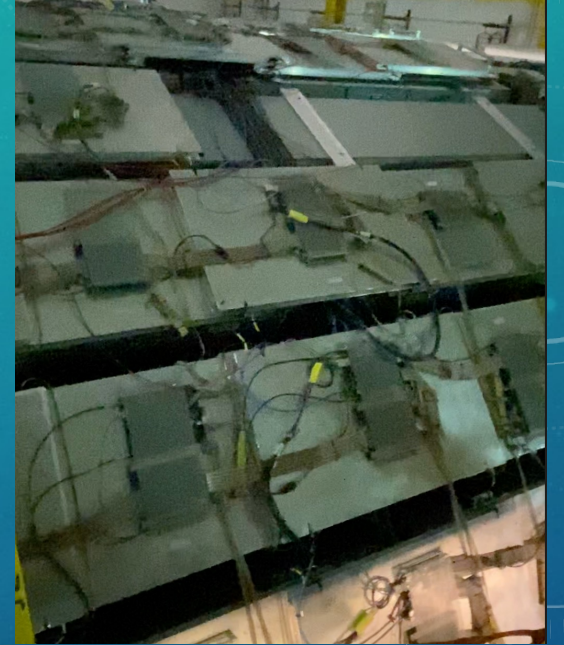
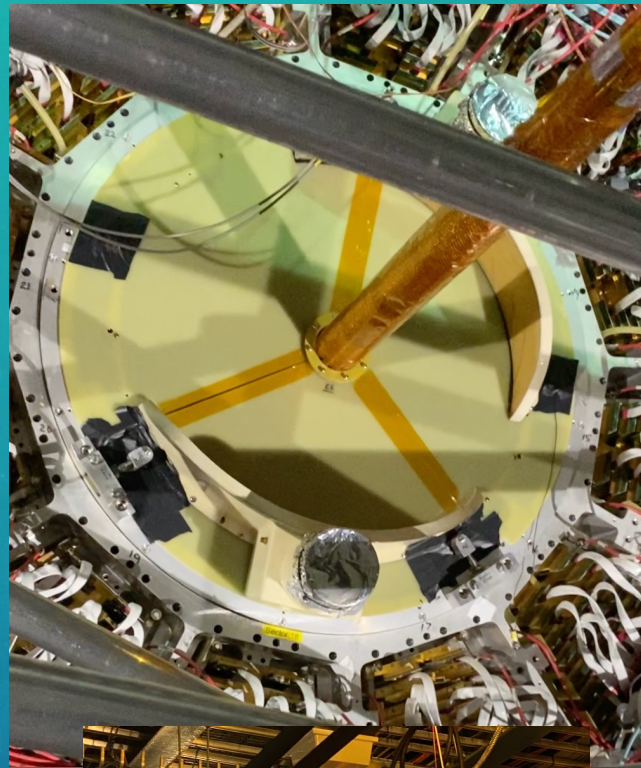
- It takes 15 billion years to form
- Very complicated to create anti-heavy ion nucleus
- 2011 RHIC used Au + Au to discover the Antihelium anti-alpha



STAR



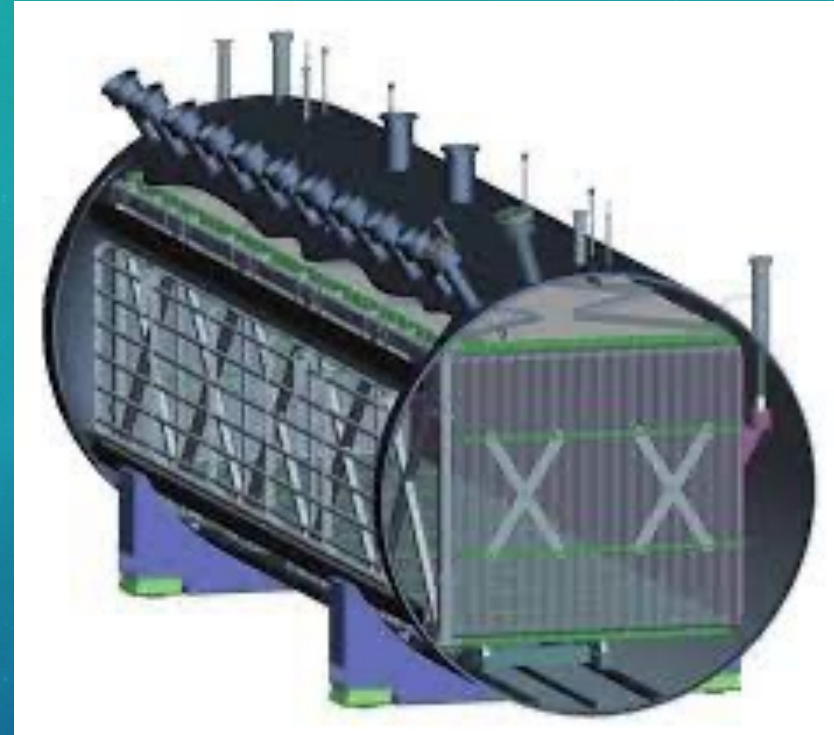
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NEUTRINOS

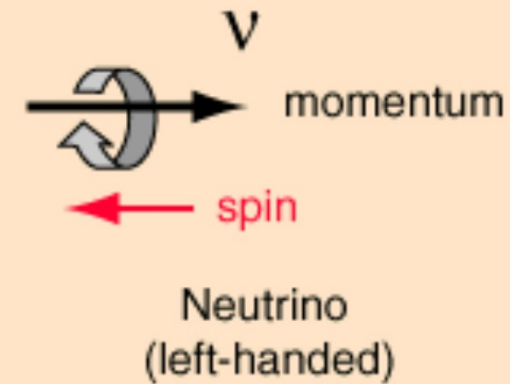
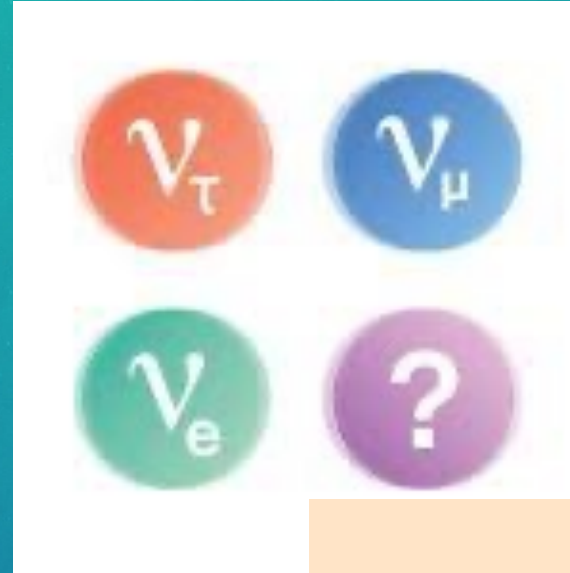
Liquid Argon TPC (LArTPC)

- Liquid argon: an imaging scintillator, helps see the tracks
 - Use is cheaper than most noble gases, and 1% of argon is in the atmosphere, and is very dense to help detect neutrinos
 - different from water scintillators
 - MicroBooNe uses liquid Argon
- Neutrinos interact with argon to produce muons or an other ions

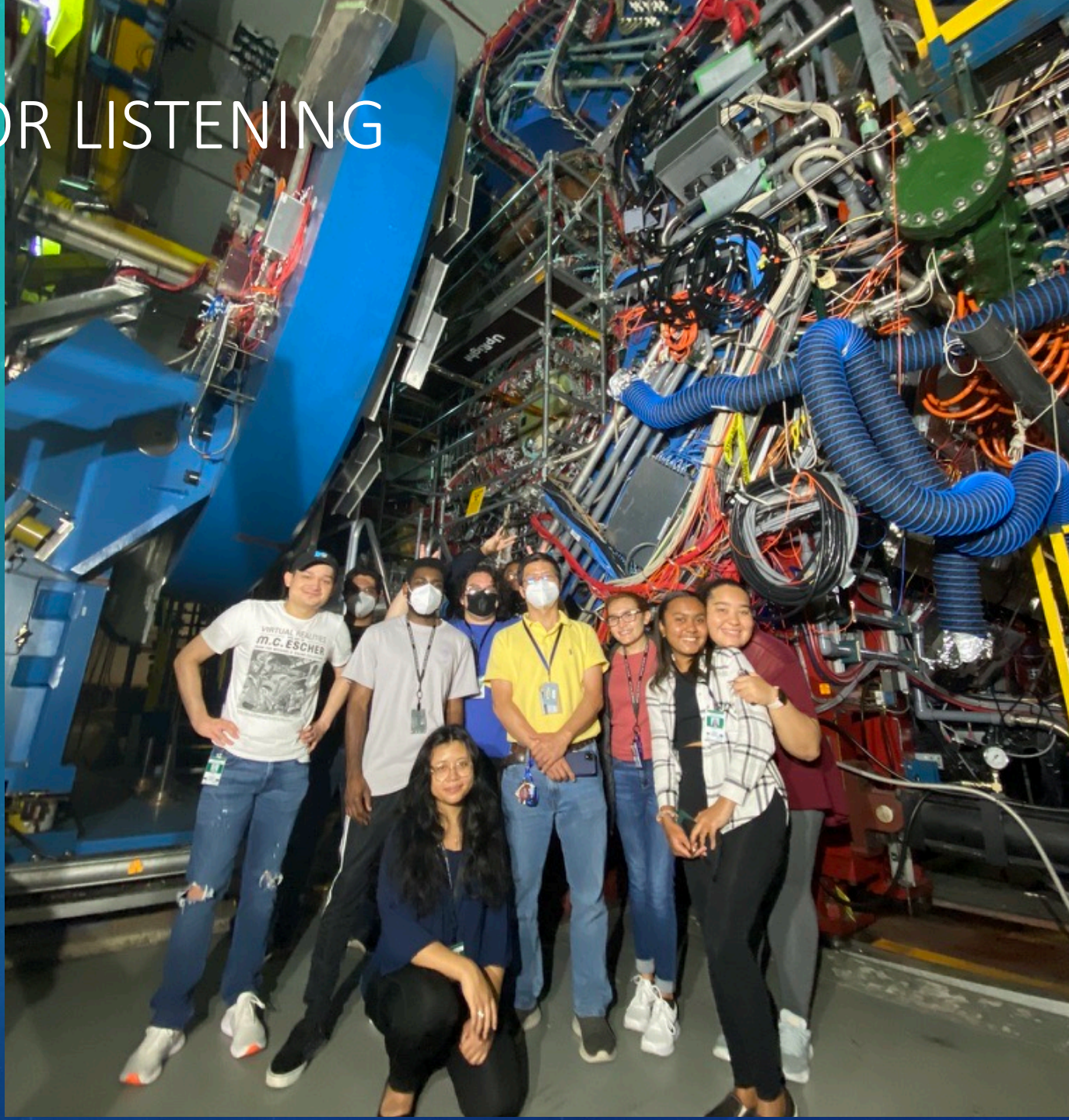


NEUTRINOS

- All Neutrinos are only Left handed
 - Experience weak force
 - the spin is always opposite the linear momentum which is referred to the left hand
- Sterile Neutrinos are right handed
 - Don't experience any known forces (except gravity)
 - Heavy sterile neutrinos may explain the lightness of active neutrinos
 - Still need to understand more about sterile neutrinos



THANK YOU FOR LISTENING

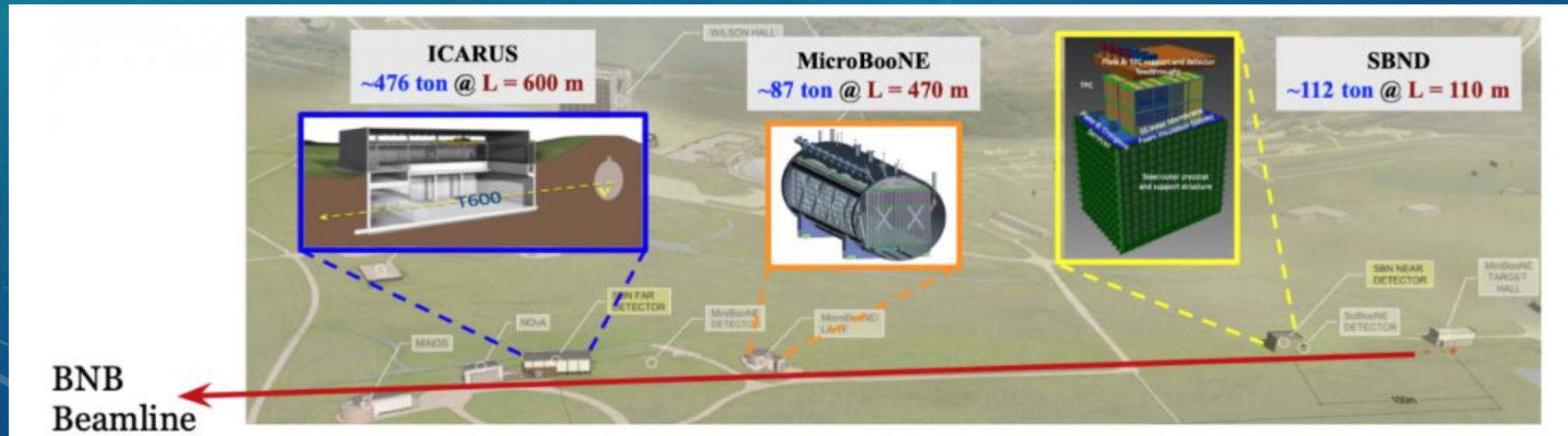
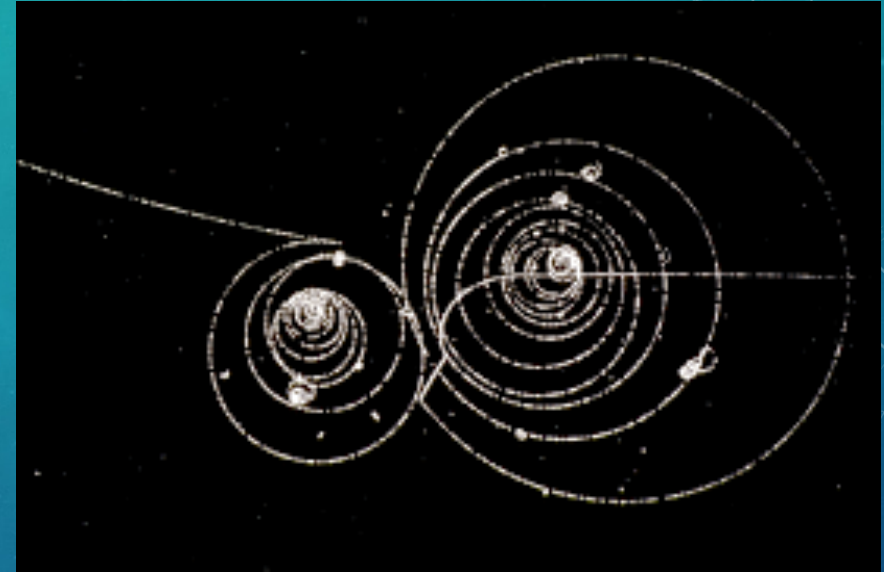


QUESTIONS

Why is the importance of finding antimatter?

Why are the neutrino detectors placed the way they are on the BNB Beamline(ICARUS, MicroBooNE, SBND)?

What other components of the MTD are they good for?



REFERENCES

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